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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 11

Application Number: 09/332,415
Filing Date: June 14, 1999
Appellant(s): LESIEUR, ROGER R.

William W. Jones
For Appellant

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed 22 May 2001.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

While the appellant states that there are no related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal, it appears that application 09/321,390 is such related appeal.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows:

Regarding "A. Does the use of the phrase "the processed gas stream" render the subject matter of Claim 1 unclear?", the examiner notes that rejection of claim 1 regarding use of the phrase "the processed gas stream" has been overcome by Amendment filed on 10 January 2001.

Regarding "B. Does the phrase "said noble metal catalyst" in Claim 9 have sufficient antecedence?", the examiner notes that rejection of claim 9 regarding use of the phrase "said noble metal catalyst" has been overcome by Amendment filed on 10 January 2001.

Regarding "C. Is the Markush recitation of catalysts contained in Claim 9 indefinite?", the examiner notes that rejection of claim 9 regarding indefinite Markush recitation has been overcome by Amendment filed on 10 January 2001.

(7) Grouping of Claims

Appellant's brief includes a statement that "Claims 23 and 18 each stand or fall separately; Claims 13-15 stand or fall together; and Claims 1, 2, 7, 9, 12, 16, 17, 19, 20 and 22 stand or fall together." and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

A substantially correct copy of appealed claim1-2, 7, 9, 12-20 and 22-23 appears on pages 29-31 of the appellant's brief, in Appendix. The minor errors are as follows:

- claim 1 in line 14 recites "processed gas stream" instead of "process gas stream";
- claim 2 in line 2 recites "a noble metal and calcium oxide" instead of "a noble metal catalyst and calcium oxide";
- claim 9 in lines 2-3 recites "platinum, palladium and rhodium, and mixtures thereof" instead of "platinum, palladium, rhodium, and mixtures thereof";
- claim 22 in line 14 recites "the processed gas stream" instead of "the process gas stream".

(9) Prior Art of Record

USP 3,904,554	Dicks	9 September 1975
USP 4,308,233	Narumiya et al.	29 December 1981
USP 4,415,484	Setzer et al.	15 November 1983
USP 5,384,099	Sheller	24 January 1995
USP 5,498,370	Bhattacharyya et al.	12 March 1996

WO 98/08771 Clawson 5 March 1998

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Rejection of Claims 1-2, 7, 9, 12-18, 20 and 22 Under Judicially Created Doctrine of Obviousness-Type Double Patenting

Claim(s) 1-2, 7, 9, 12-18, 20 and 22 is/are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim(s) 1-22 of copending Application No. 09/321,390 in view of Dicks (USP 3,904,554).

Claims 1-22 of the copending Application No. 09/321,390 recite all of the claim limitations as recited in claims 1-2, 7, 9, 12-18, 20 and 22 of the instant application, but they do not explicitly recite said subsequent second region which contains a copper and/or zinc catalyst.

Dicks teaches a steam reforming process wherein reforming region contains a copper and/or zinc catalyst (Abstract & C5/L7-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a copper and/or zinc catalyst, as taught by Dicks, in the reforming region of the reformer recited by claims 1-22 of the copending Application No. 09/321,390, for the purpose of providing a catalyst which is more resistant to poisoning by sulfur than other catalysts (usually containing nickel), which are generally used in steam reforming process.

This is a provisional obviousness-type double patenting rejection.

Rejection of Claims 19 and 23 Under Judicially Created Doctrine of Obviousness-Type Double Patenting

Claim(s) 19 and 23 is/are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim(s) 1-22 of copending

Application No. 09/321,390 in view of Dicks (USP 3,904,554), as applied to claim(s) 1-2, 7, 9, 12-18, 20 and 22 above, and further in view of Clawson (WO 98/08771).

Claims 1-22 of the copending Application No. 09/321,390 in view of Dicks recite all of the claim limitations as recited in claims 19 and 23 of the instant application. Additionally, while they do not explicitly recite said fuel gas being methanol, using methanol as a fuel was well known in the art at the time the invention was made (as evidenced by Clawson, P20/L23-24), the fuel selection being driven by system requirements, such as desired finished product composition and by fuel availability and cost. As the instant specification is silent to unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use methanol as fuel gas, as taught by Clawson, in an assembly recited by claims 1-22 of the copending Application No. 09/321,390 in view of Dicks, for the purpose of obtaining desired product at optimal process cost.

This is a provisional obviousness-type double patenting rejection.

Rejections Under 35 U.S.C. 112

None.

Rejection of Claim 23 Under 35 U.S.C. 103

Claim(s) 23 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) and further in view of Setzer et al. (USP 4,415,484).

Regarding claim(s) 23, Clawson disclose(s) similar autothermal reformer assembly (in Fig. 3), said assembly comprising a catalyst bed (200), said catalyst bed including an inlet end (210) and an outlet end (270), an inlet portion of said catalyst bed being operable to combust a portion of the

methanol fuel gas (P20/L23-24) thereby enabling start up of the reformer assembly while inhibiting carbon deposition in catalyzed cells of said catalyst bed (P24/L1-7 & P5/L12-19).

While Clawson discloses using a supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam support (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas stream in the inlet region of the reactor for the purpose of rising the temperature of the fuel gas stream and enabling start up of the reformer assembly (P24/L1-7), the reference does not explicitly disclose said inlet region being provided with a noble metal catalyst which is operable to combust said portion of the fuel gas stream at a temperature of about 200°F.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a noble metal catalyst that is operable to combust a portion of the fuel gas stream at a temperature of about 200°F (C4/L29-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a noble metal catalyst which is operable to combust a portion of the fuel gas stream at a temperature of about 200°F, as taught by Setzer et al., in the inlet portion of the catalyst

bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing the air into the reactor.

Rejection of Claim 1-2, 7, 9, 12, 16-17, 19-20 and 22 Under 35 U.S.C. 103

Claim(s) 1-2, 7, 9, 12, 16-17, 19-20 and 22 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) further in view of Setzer et al. (USP 4,415,484) and further in view of Dicks (USP 3,904,554).

Regarding claim(s) 1, Clawson disclose(s) similar autothermal reformer assembly (in Fig. 3), said assembly comprising:

a) a catalyst bed (200), said catalyst bed including an inlet end (210) and an outlet end (270), a first inlet region of said catalyst bed being operable to combust a portion of the fuel gas stream so as to raise the temperature of said fuel gas stream in said first region to a temperature in the range of about 300° to about 500°F while inhibiting carbon deposition in catalyzed cells of said catalyst bed (P24/L1-7 & P5/L12-19), and said catalyst bed further including a subsequent second region which contains a catalyst (225);

b) a fuel gas stream inlet passage (208), said fuel gas stream inlet passage (208) being disposed in heat exchange relationship with a process gas stream outlet passage from said catalyst bed whereby heat is transferred to said fuel gas stream inlet passage from the process gas stream (P20/L7-11 & P21/L7-10);

c) an air inlet passage (232), said air inlet passage being disposed in heat exchange relationship with the process gas stream whereby heat from the process gas stream is transferred to said air inlet passage (P22/13-15); and

d) a fuel gas stream reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using a supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam support (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas stream in the inlet region of the reactor for the purpose of rising the temperature of the fuel gas stream (P24/L1-7), the reference does not explicitly disclose said inlet region being provided with a catalyst which is operable to combust said portion of the fuel gas stream.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a catalyst that is operable to combust a portion of the fuel gas stream (C4/L29-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a catalyst which is operable to combust a portion of the fuel gas stream, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing the air into the reactor.

While Clawson discloses said catalyst bed further including a subsequent second region which contains a catalyst (225), the reference does not explicitly disclose said subsequent region containing a copper and/or zinc catalyst.

Dicks teaches a steam reforming assembly wherein reforming region contains a copper and/or zinc catalyst (Abstract & C5/L7-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a copper and/or zinc catalyst, as taught by Dicks, in the reforming region of the assembly of Clawson, for the purpose of providing a catalyst which is more resistant to poisoning by sulfur than other catalysts (usually containing nickel), which are generally used in steam reforming process.

Regarding claim(s) 2, 7 and 9, Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks disclose(s) all of the claim limitations as set forth above. Additionally Setzer et al. teaches the autothermal reformer assembly, wherein:

- said catalyst in said first region of said catalyst bed includes a noble metal catalyst and calcium oxide (C2/L5-6 & C4/L29-66);
- said first region of said catalyst bed contains an iron oxide catalyst in combination with calcium oxide (C4/L29-66);
- said noble metal catalyst is a catalyst selected from the group consisting of platinum, palladium, rhodium and mixtures thereof (C2/L5-6 & C4/L29-66).

Regarding claim(s) 12, Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks disclose(s) all of the claim limitations as set forth above. Additionally Narumiya et al. teaches the catalyst bed, wherein said catalyst bed includes at least one ceramic foam support body (C2/L45-49).

Regarding claim(s) 16-17 and 19, Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks disclose(s) all of the claim limitations as set forth above. Additionally Clawson discloses the autothermal reformer assembly, wherein:

- said catalyst bed is cylindrical in shape (Fig. 3);
- said fuel gas stream inlet passage (208) contains a fuel gas/steam mixture (P20/L7-9);
- said fuel gas is methanol (P20/L23-24).

Regarding claim(s) 20, Clawson disclose(s) similar autothermal reformer assembly (in Fig. 3), said assembly comprising:

a) a cylindrical catalyst bed (200), said catalyst bed including an inlet end (210) and an outlet end (270);

b) a fuel gas/steam mixture inlet passage (208, P20/L7-9);

c) a fuel gas reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using a supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam support (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas stream in the inlet region of the reactor for the purpose of rising the temperature of the fuel gas stream (P24/L1-7), the reference

does not explicitly disclose said inlet region being provided with a noble metal catalyst which is operable to combust said portion of the fuel gas stream.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a noble metal catalyst that is operable to combust a portion of the fuel gas stream (C4/L29-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a noble metal catalyst which is operable to combust a portion of the fuel gas stream, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing the air into the reactor.

While Clawson discloses said catalyst bed further including a subsequent second region which contains a catalyst (225), the reference does not explicitly disclose said subsequent region containing a copper and/or zinc catalyst.

Dicks teaches a steam reforming assembly wherein reforming region contains a copper and/or zinc catalyst (Abstract & C5/L7-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a copper and/or zinc catalyst, as taught by Dicks, in the reforming region of the assembly of Clawson, for the purpose of providing a catalyst which is more resistant to poisoning by sulfur than other catalysts (usually containing nickel), which are generally used in steam reforming process.

Regarding claim(s) 22 Clawson disclose(s) a similar autothermal reformer assembly (in Fig. 3), said assembly comprising:

a) a catalyst bed (200), said catalyst bed including an inlet end (210) and an outlet end (270), an inlet portion of said catalyst bed being operable to combust a portion of the fuel gas thereby enabling start up of the reformer assembly while inhibiting carbon deposition in catalyzed cells of said catalyst bed (P24/L1-7 & P5/L12-19);

b) a fuel gas stream inlet passage (208), said fuel gas stream inlet passage (208) being disposed in heat exchange relationship with a process gas stream outlet passage from said catalyst bed whereby heat is transferred to said fuel gas stream inlet passage from the processed gas stream (P20/L7-11 & P21/L7-10);

c) an air inlet passage (232), said air inlet passage being disposed in heat exchange relationship with the process gas stream whereby heat from the process gas stream is transferred to said air inlet passage (P22/13-15); and

d) a fuel gas stream reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using a supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam support (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas stream in the inlet region of the reactor for the purpose of rising the temperature of the fuel gas stream and enabling start up of

the reformer assembly (P24/L1-7), the reference does not explicitly disclose said inlet region being provided with a noble metal catalyst which is operable to combust said portion of the fuel gas stream at a temperature of about 200°F.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a noble metal catalyst that is operable to combust a portion of the fuel gas stream at a temperature of about 200°F (C4/L29-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a noble metal catalyst which is operable to combust a portion of the fuel gas stream at a temperature of about 200°F, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing the air into the reactor.

While Clawson discloses said catalyst bed further including a subsequent second region which contains a catalyst (225), the reference does not explicitly disclose said subsequent region containing a copper and/or zinc catalyst.

Dicks teaches a steam reforming assembly wherein reforming region contains a copper and/or zinc catalyst (Abstract & C5/L7-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a copper and/or zinc catalyst, as taught by Dicks, in the reforming region of the assembly of Clawson, for the purpose of providing a catalyst which is more resistant to poisoning by sulfur than other catalysts (usually containing nickel), which are generally used in steam reforming process.

Rejection of Claim 13-15 Under 35 U.S.C. 103

Claim(s) 13-15 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) further in view of Setzer et al. (USP 4,415,484) and further in view of Dicks (USP 3,904,554), as applied to the claim(s) 1-2, 7, 9, 12, 16-17, 19-20 and 22 above, and further in view of Sheller (USP 5,384,099).

Regarding claim(s) 13-15, Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks disclose(s) all of the claim limitations as set forth above, but the do not do not explicitly disclose the catalyst bed comprising an autothermal reformer-operating temperature-compatible metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys, said support being connected to a source of electrical current so as to serve as a resistance heating element during start-up of said reformer assembly by being electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto.

Sheller teaches a monolithic catalyst bed, wherein:

- said catalyst bed includes an autothermal reformer-operating temperature-compatible metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys (C1/L26-29);
- said metal support is connected to a source of electrical current, so as to serve as a resistance heating element (C1/L52-63);
- said metal support is electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto (C1/L65-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide an autothermal reformer-operating temperature-compatible metal support

connected to a source of electrical current, as taught by Sheller, in the assembly of Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks, for the purpose of activating the catalyst during the start up of the reformer.

Rejection of Claim 18 Under 35 U.S.C. 103

Claim(s) 18 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) further in view of Setzer et al. (USP 4,415,484) and further in view of Dicks (USP 3,904,554), as applied to the claim(s) 1-2, 7, 9, 12, 16-17, 19-20 and 22 above, and further in view of Bhattacharyya et al. (USP 5,498,370).

Regarding claim(s) 18, Clawson in view of Narumiya et al. further in view of Setzer et al. and further in view of Dicks disclose(s) all of the claim limitations as set forth above. Additionally Clawson discloses the autothermal reformer assembly, wherein said air inlet passage contains air (P23/L19-22), but the reference does not explicitly disclose said air inlet passage containing an air/steam mixture.

Bhattacharyya et al. teaches an assembly using steam as a temperature modifier and to avoid soot formation in partial oxidation of hydrocarbons (C2/L53-55).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to add steam, as taught by Bhattacharyya et al., to said air inlet passage of Clawson, for the purpose of using the steam as a temperature modifier and to avoid soot formation.

(11) Response to Argument

Response to Arguments Regarding Rejection of Claims 1-2, 7, 9, 12-20 and 22-23 Under Judicially Created Doctrine of Obviousness-Type Double Patenting

The examiner notes that the appellant has not set forth any arguments regarding rejection of claims 1-2, 7, 9, 12-20 and 22-23 under judicially created doctrine of obviousness-type double patenting.

Response to Arguments Regarding Claim Rejections Under 35 U.S.C. 112

The appellant's argument regarding the issue of examiner's educational background and/or work experience is not one of the issues under consideration, but rather what evidence does the appellant have to support his/her position. Appellant is advised to direct comments to the merits of the rejections or objections. See *In re Nilssen* 7 USPQ 2d 1500.

Response to Arguments Regarding Rejection of Claim 23 Under 35 U.S.C. 103

Regarding combination of Clawson and Narumiya et al., the appellant argues that one would not be likely to use an oxidizing catalyst bed in a steam reformer, because if one did make such substitution the result would be to oxidize or burn all of the hydrogen in the partially oxidized gas stream, which would be an undesirable.

The examiner notes that Narumiya et al. was not relied upon to teach substituting a catalyst bed of Narumiya et al. for catalyst bed of Clawson or using an oxidizing catalyst in a steam reformer or partial oxidation reformer.

The examiner has however relied on the disclosure of Narumiya et al. to teach a cylindrical monolithic open cell foam structure (Fig. 1, C4/L30-32) which can be used as a support for any catalyst (either oxidizing catalyst or steam reforming catalyst or any other catalyst). Since both references disclose use of supported noble metal catalyst (see Clawson P19/L29-P20/L7 and

P21/L13-17 and Narumiya et al. C2/L45-55) it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the process gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas (Narumiya et al., C2/L24-31).

In response to appellant's argument that the examiner is not considering the reference of Narumiya et al. as a whole, but rather "picking and choosing parts of the teachings" in support of the rejection, the examiner would like to point out that test for obviousness is not whether all the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, the combined teachings of the references would suggest that it was well known in the art at the time the invention was made to use monolithic open cell foam support for a catalyst (including noble metal catalyst, see Narumiya et al. C2/L45-55), said support providing structure which allows process gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas (Narumiya et al., C2/L24-31). Additionally, it is generally known in the art that use of monolithic cell foam structure, as disclosed by Narumiya et al., as a catalyst support not only increases mechanical strength (see Narumiya et al., C2/L24-31), but also renders the device using said catalyst support lighter and more compact. Since both, the instant invention and Clawson (P2/L1-5 and P5/L19-24), are concerned with making a steam reformer lighter and more compact, it would have been obvious to one of ordinary skill in

the art at the time the invention was made to further modify the light and compact reformer design of Clawson with even lighter and more compact catalyst support of Narumiya et al, as one of ordinary skill in the art at the time the invention was made would recognize that a catalyst support can be used for various catalysts without changing the principles of their catalytic activity, and therefore, when looking for modification of said catalyst support, one of ordinary skill in the art would utilize teachings regarding said catalyst support which can be found in various applications, and not just in one specific application, such as steam reforming.

The appellant arguments that the examiner has no grounds in stating that "Setzer et al. teaches an inlet portion of a catalyst bed being provided with a catalyst which is operable to combust a portion of the fuel gas stream at a temperature of about 200°F" are not found persuasive. The examiner has not only not ignored the limitation of a "start-up temperature of reformer", but by relying upon said reference to disclose "catalyst which is operable to combust a portion of the fuel gas stream at a temperature of about 200°F", the examiner has treated said limitation literally as recited in rejected claim(s). The examiner would like to point out that the term "operable" means "being such that use or operation is possible" (*The American Heritage® Dictionary of the English Language, Third Edition* copyright © 1992 by Houghton Mifflin Company; Electronic version licensed from INSO Corporation). Even though the limitation of "catalyst being operable (...)" is not a positive limitation in any patentable sense, but only requires possibility of said operation (see *In re Hutchison,* 69 USPQ 138), it is examiner's position that: (1) as combustion of a portion of the fuel gas stream at a temperature of about 200°F does not impart any further structural limitations on the reformer assemblage disclosed by cited combination of references, and (2) as said reformer assemblage, as set forth above, has the same structure and catalyst combination as the instantly

claimed invention, said reformer assemblage contains a catalyst that is, in fact, operable to combusts a portion of the fuel gas at a temperature of about 200°F.

Further, the appellant argues that the motivation for combining two references, specifically Clawson and Setzer et al., must be found in the prior art. This is not found persuasive, since the obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Additionally, the examiner would like to point out that the motivation statement in question (that substituting catalyst arrangement of Setzer et al. in the assembly of Clawson is done for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing air into the reactor) can be found in the references themselves (see Setzer et al., C4/L63-66).

Response to Arguments Regarding Rejection of Claims 1-2, 7, 9, 12-20 and 22 Under 35 U.S.C. 103

With respect to appellant's arguments regarding the motivation statement for combining two references, specifically Clawson and Setzer et al., the same response applies as set forth above.

The appellant arguments that the examiner's analysis of Clawson is erroneous, because the reference does not suggest the claimed temperature range are not found persuasive. The examiner has not only not ignored the limitation of "a temperature to which the temperature of fuel gas in said first passage is raised", but by relying upon said reference to disclose "inlet region of sad catalyst bed which is operable to combust a portion of the fuel gas stream so as to raise the temperature of

said fuel gas stream in said first region to a temperature in the range of about 300° to about 500°F", the examiner has treated said limitation literally as recited in rejected claim(s). Again, the examiner would like to point out that the term "operable" means "being such that use or operation is possible" (*The American Heritage® Dictionary of the English Language, Third Edition* copyright © 1992 by Houghton Mifflin Company; Electronic version licensed from INSO Corporation). Even though the limitation of "region being operable (...)" is not a positive limitation in any patentable sense, but only requires possibility of said operation (see *In re Hutchison*, 69 USPQ 138), it is examiner's position that: (1) as combustion of a portion of the fuel gas stream so as to raise the temperature of said fuel gas stream in said first region to a temperature in the range of about 300° to about 500°F does not impart any further structural limitations on the reformer assemblage disclosed by cited reference, and (2) as said reformer assemblage, as set forth above, has the same structure as the instantly claimed invention, said reformer assemblage contains an inlet region that is, in fact, operable to combusts a portion of the fuel gas so as to raise the temperature of said fuel gas stream in said first region to a temperature in the range of about 300° to about 500°F.

The appellant's arguments regarding alleged examiner's referrals to partial oxidation zone 24 of Clawson as the first region are not persuasive, since the examiner has not made such referrals.

The appellant argues that the combination of Dicks with the other references is not proper because, since there is no sulfur in ethanol or methanol, the problem which the examiner is solving does not exists in the claimed reformer.

This is not found persuasive, since the obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In the instant case the primary reference of Clawson discloses using either hydrocarbon fuel or alcohol as reformer feed (see Abstract), and further the reference discloses that said feed can comprise gasoline, JP-8, methanol, ethanol, kerosene and other suitable hydrocarbons typically used in reformers (P11/L15-20). As "other suitable hydrocarbons typically used in reformers" comprise, for example, natural gas, which contains sulfur, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a copper and/or zinc catalyst, as taught by Dicks, in the reforming region of the assembly of Clawson, for the purpose of providing a catalyst which is more resistant to poisoning by sulfur than other catalysts (usually containing nickel), which are generally used in steam reforming process.

The appellant's arguments that examiner's "conjecture or conclusionary assertions" regarding copper or zinc catalyst being more resistant to sulfur than nickel catalyst do not provide the necessary factual basis for establishing a prima facie case of obviousness are not found persuasive, because the obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In the instant case, the motivation statement in question (that either copper or zinc catalyst are more resistant to sulfur than nickel catalyst) can be found in the references themselves (see Dicks, Abstract & C4/L66-C5/L21).

The appellant argues that the examiner's analysis of Clawson is incorrect, because numeral 208 in Clawson denotes initial portion of catalyst bed filled with catalyst 214 and not a fuel gas inlet, said fuel gas inlet being denoted by numeral 219. Therefore, as the fuel gas inlet passage 219

is not disposed in heat exchange relationship with processed gas passage, the pre-heating of the fuel gas stream as claimed in instant application does not occur.

In response the examiner notes that Fig. 3 of Clawson shows a first passage, within tube 208, for receiving a mixture of steam and a first hydrocarbon or alcohol fuel (P20/L7-9). Therefore said first passage is "a fuel gas inlet passage" as recited in rejected claims. Further, said Fig. 3 shows a second passage, located between tubes 208 and 218 which continues between tubes 218 and 224 which continues between tubes 224 and 252 and which further continues between tubes 252 and 202, for transferring a processed fuel gas stream to reformer outlet (P19/L19-P23/L7). Therefore said second passage is "an outlet passage" in which "a processed fuel gas stream" is disposed, as recited in rejected claims. Therefore, as it can be seen in Fig. 3, said first passage is disposed in heat exchange relationship with said second passage. Additionally, as reaction occurring in said first passage is an endothermic steam reforming reaction (P19/L25-29) and a reaction occurring in said second passage is an exothermic partial oxidation reaction (P24/L1-13) the heat from said second passage "will be transferred" to said first passage, again, as recited in rejected claims.

Additionally, the examiner notes that the instant claim language: "a hydrocarbon fuel gas autothermal reformer assembly comprising (...)" does not distinguish between the instant invention and the reformer assembly disclosed by Clawson, as said language does not exclude reformer assemblies wherein a fuel gas inlet passage further comprises a catalyst.

Further, the examiner would like to point out that passage 219 of Clawson is also disposed in heat exchange relationship with processed fuel gas stream outlet passage (second passage, as set forth above), since passage 219 comes in contact with reformer 200 and reformer 200 comprises

said processed fuel gas stream outlet passage. Therefore there is a heat exchange between said passage 219 and said processed fuel gas stream outlet passage.

In response to appellant's argument that the references fail to show certain features of appellant's invention, the examiner notes that the features upon which appellant relies (i.e., pre-heating of the fuel gas) are not recited in the rejected claim(s), as said claims merely recite heat exchange relationship, "whereby heat will be transferred to said fuel gas inlet passage from the processed gas stream". Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The examiner notes that the above statement that "pre-heating of the fuel gas is not recited in the rejected claim(s)" was not caused by examiner ignoring "contents of the whereby statement", as argued by the appellant, but rather by the fact that said claim(s) do not recite "fuel gas being pre-heated". The examiner would like to point out that recitation of "heat (being) transferred" to a passage, as recited in the instant claims, is much more broad than recitation of pre-heating a gas stream in said passage, since transferred heat can be utilized for many different purposes (e.g. for maintaining passage temperature constant or for evaporating passage contents) and not necessarily for pre-heating of said passage contents. Additionally, the examiner would like to point out that Clawson does, in fact, disclose the fuel gas in said first passage, as set forth above, being pre-heated (see P23/L16-18).

Response to Arguments Regarding Rejection of Claims 13-15 Under 35 U.S.C. 103

The appellant argues that one of ordinary skill in the art would not use the teaching of Sheller for heating a monolith, as Sheller suggests that monoliths could not be satisfactorily electrically heated due to their low electrical resistance.

This is not found persuasive, because the reference of Sheller teaches that it was well known in the art to use a catalyst bed supported on a monolith, wherein said monolith includes a metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys (C1/L26-29) and wherein said metal support is connected to a source of electrical current, so as to serve as a resistance heating element (C1/L52-63) and wherein said metal support is electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto (C1/L65-66).

Further, while the reference does state that many of said electrically heatable monoliths might not prove satisfactory when exposed to very stringent automotive industry durability tests (C2/L12-16), it also states that said monoliths were useful in less stringent environment (C2/L65-66). The examiner notes that the test for obviousness is not whether all the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a metal support connected to a source of electrical current, as taught by Sheller, in the assembly of Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of activating the catalyst during the start up of the reformer.

With respect to appellant's arguments regarding the reference of Narumiya et al. the same response applies as set forth above.

Response to Arguments Regarding Rejection of Claim 18 Under 35 U.S.C. 103

The appellant's argument regarding reference of Bhattacharyya et al. is not found persuasive, as the examiner has not relied on said reference to "cure the deficiencies of the other four references used in the rejection (...) discussed in detail above". The examiner has, however, relied on Bhattacharyya et al. to teach an assembly using steam as a temperature modifier and to avoid soot formation in partial oxidation of hydrocarbons (C2/L53-55), and to establish that it would have been obvious to one having ordinary skill in the art at the time the invention was made to add steam, as taught by Bhattacharyya et al., to said air inlet passage of Clawson, for the purpose of using the steam as a temperature modifier and to avoid soot formation.

With respect to appellant's arguments regarding the motivation statement for combining two references, specifically Clawson and Setzer et al., the same response applies as set forth above.

Response to Arguments Regarding Non-Analogous Arts

The appellant argues that the references of Narumiya et al. and Sheller are non-analogous, and that one seeking to solve the problem solved by the instant invention would not be likely to consult catalytic converter art for a solution.

In response to said argument, the examiner would like to point out that it has been held that a prior art reference must either be in the field of appellant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the appellant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

In this case, both, the instant invention (P3/L9-P7/L11) and Clawson (P2/L1-5 and P5/L19-24), are concerned with making a steam reformer lighter and more compact. Further, the instant invention (P3/L9-P7/L11) is concerned with allowing for quick (within about 20 seconds) start-up

of said reformer by bringing catalyst in said reformer to operating temperatures. These are the particular problems that are being solved by the instant invention.

Narumiya et al. and Sheller teach a catalyst support that can be used to support noble metal catalyst. Said support was well known in the art to render assemblies using said support lighter and more compact and to allow for electrical heating to quickly bring said catalyst to operating temperatures. Therefore the references of Narumiya et al. and Sheller are reasonably pertinent to the particular problem with which the appellant was concerned.

Further, it is examiner's position that one of ordinary skill in the art at the time the invention was made would recognize that catalyst support and means for heating said support can be used in various catalyst applications without changing principles of operation of catalyst which is being supported on said support. Therefore, when looking for modification of said catalyst support, one of ordinary skill in the art would utilize teachings regarding said catalyst support which can be found in various applications, and not just in one specific application, such as steam reforming.

(12) Conclusion

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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